



Validation Report

Reference Number: PVR–205
Project Number: 28191
Loan Number: 1794
December 2012

Cambodia: Provincial Power Supply Project

Independent Evaluation Department
Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
AFD	–	Agence Française de Développement
EDC	–	Electricite du Cambodge
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
IED	–	Independent Evaluation Department
MV	–	medium voltage
PCR	–	project completion report
RRP	–	Report and Recommendation of the President
WTP	–	willingness to pay

WEIGHTS AND MEASURES

km	–	kilometer
kV	–	kilovolt
MW	–	megawatt
V	–	volt

NOTE

In this report, “\$” refers to US dollars.

Key Words

adb, asian development bank, cambodia, energy sector, infrastructure, performance evaluation, power subsector, provincial towns

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PROJECT BASIC DATA

Project Number:	28191	PCR Circulation Date:	28 Aug 2008	
Loan Number:	1794	PCR Validation Date:	Dec 2012	
Project Name:	Provincial Power Supply Project			
Country:	Cambodia		Approved (\$ million)	Actual (\$ million)
Sector:	Energy	Total Project Costs:	24.17	24.98
ADB Financing: (\$ million)	ADF: 18.6	Loan:	18.62	19.39
	OCR: 0.0	Borrower:	5.10	0.96
		Beneficiaries:	0.45	0.00
		Others:	0.00	4.63
Cofinancier:	Agence Française de Développement (AFD)	Total Cofinancing:	5.55	5.59
Approval Date:	5 Dec 2000	Effectiveness Date:	4 Jul 2001	1 Aug 2001
Signing Date:	18 Mar 2003	Closing Date:	31 Dec 2004	5 Apr 2007
Project Officers:	M. Bristol A. Jude A. Goffeau	Location:	ADB headquarters Cambodia Resident Mission Cambodia Resident Mission	
Validators:	D. Parish, Consultant F. De Guzman, Evaluation Officer, IED2	Peer Reviewer:	M. Gatti, Principal Evaluation Specialist, IED2	
Quality Reviewer:	C. Kim, Principal Evaluation Specialist. IED2	Director:	H. Hettige, IED2	

ADB = Asian Development Bank, ADF = Asian Development Fund, IED 2 = Independent Evaluation Department (Division 2), OCR = ordinary capital resources, PCR = project completion report.

I. PROJECT DESCRIPTION

A. Rationale

1. Cambodia's power infrastructure suffered from years of neglect because of nearly 3 decades of war and political instability. The generation and distribution facilities were in poor condition due to their age and lack of proper maintenance. System losses were very high, and reliability and quality of power supply were inadequate. Adequate electricity systems were absent in the whole of the country except in Kompong Cham, Phnom Penh, Siem Reap, and Sihanoukville.

2. Economic growth in the provincial towns was constrained by inadequate and high-priced electricity systems. The provincial towns are the immediate markets, transport depots, and processing centers for provincial agricultural products. As agricultural productivity and per capita incomes rise, demand for electricity from residential customers and small enterprises is expected to steadily increase. Private electricity suppliers in the country were inefficient and small, and used old equipment. Without public sector involvement, improvements in electricity supply were unlikely to happen.

3. The Asian Development Bank (ADB) assistance was based on its past support in rehabilitating the country's power infrastructure in phases. ADB initially focused on providing

emergency generation and distribution facilities in Phnom Penh.¹ This was followed by the rehabilitation of electricity systems in Phnom Penh and in the two important provincial towns of Siem Reap and Sihanoukville.² This Provincial Power Supply Project (the project) was formulated to address issues in other major provincial towns.

B. Expected Impact

4. As indicated in the project framework, the project's targeted impact at appraisal was to stimulate economic growth with indirect poverty reduction benefits for the urban poor and the surrounding populations. The performance indicator was increased sales of power in the project towns, to at least 5% of Electricité du Cambodge (EDC) sales in Battambang, Kampong Cham, Phnom Penh, Siem Reap, and Sihanoukville by 2007. A longer-term goal was to create an enabling environment for private sector participation in the future power system expansion.

C. Objectives or Expected Outcomes

5. The intended outcomes of the project were the following: (i) expanded availability of reliable power supply in eight provincial towns and villages along the transmission route to the Viet Nam border, with tariffs that were to achieve a 4% rate of return in each town by 2005; (ii) creation of suitable management and operating organizations in the provincial towns so that the systems could become efficient and financially viable; (iii) strengthened capacity of EDC for it to become financially viable; and (iv) encouragement of private sector participation in the private sector.

6. For the first outcome, the performance indicator was provision of 24-hour electricity to the following: (i) 21,000 consumers already receiving electricity service due to rehabilitation, in addition to 3,000 new consumers by 2004; and (ii) 10,000 additional consumers by 2010. For the second outcome, the indicator was reduced transmission and distribution losses in the eight provincial medium-voltage and low-voltage networks to less than 18% of energy received by 2004. For the third outcome, the performance targets were as follows: (i) provincial power utility to have an operation and maintenance budget of at least 2% of the capital cost of the works; and (ii) financial covenants met by 2001. The last targeted outcome indicator was the awarding of private contracts under competitive bidding procedures.

D. Components and Outputs

7. The project had two components:

- (i) Part A: Infrastructure. This was to undertake the replacement and/or expansion of electricity distribution systems in eight provincial towns. In five towns, new diesel generators were to be provided to meet demand forecasts up to the end of 2006. Two other towns were to be connected to existing or proposed transmission lines.
- (ii) Part B: Capacity Building. The capacity-building component was aimed at the following: (i) building institutional capacity by creating suitable management, providing operation and maintenance, and setting up maintenance organizations in the provincial centers so that new systems could become efficient and

¹ ADB. 1992. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Kingdom of Cambodia for the Special Rehabilitation Assistance Project*. Manila (Loan 1199-CAM [SF]).

² ADB. 1994. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Kingdom of Cambodia for the Power Rehabilitation Project*. Manila (Loan 1345-CAM [SF]).

financially viable; (ii) strengthening staff skills in the EDC head office; (iii) expanding the scope of training available at EDC's ADB-funded training center in Phnom Penh; and (iv) setting up a data-gathering system upon which to base future hydropower development.

E. Provision of Inputs

8. During appraisal, project cost was estimated at \$24.17 million. Foreign exchange cost accounted for \$12.13 million (about 50% of the estimated total) while local currency cost was estimated at \$12.04 million. ADB was to provide a loan equivalent to \$18.6 million from its special funds resources. The borrower was to fund the remaining cost, equivalent to \$5.55 million.

9. The government sought parallel cofinancing from Agence Française de Développement (AFD) amounting to \$2.5 million on a grant basis to finance the infrastructure in Stung Treng provincial town and partial provision of trainers at the EDC training center. AFD approved a grant for €3.75 million. As envisaged at appraisal, the AFD grant was used to cover costs for rehabilitating the distribution system, installing generation equipment in Stung Treng, and training activities at the EDC training center. Subsequently, ADB reallocated the funds originally allocated to infrastructure in Stung Treng to finance additional generation and distribution works in Battambang, Kampot, and Sisophon, as requested by the government in February 2005.

10. Actual project cost, including this extended scope, was \$24.98 million. The foreign exchange cost was equivalent to \$23.89 million (about 96% of the total), and local currency cost was equivalent to \$1.09 million (4%). ADB financed the equivalent of \$19.39 million, or about 78% of the project cost. The AFD grant accounted for \$4.63 million equivalent, or 18% of the cost. The government funded the remaining local currency cost, equivalent to \$0.96 million excluding local taxes and duties.

F. Implementation Arrangements

11. The executing agency was the EDC since it was to be the owner and operator of the facilities and the beneficiary of majority of the institutional capacity building. EDC was to set up a project implementation unit headed by an ADB-approved senior staff member. The unit was to be based at EDC headquarters in Phnom Penh but in provinces the Ministry of Industry, Mines and Energy offices were to be used during the design and construction phases. Staff members from EDC and the Ministry of Industry, Mines and Energy were to be assigned as counterparts to the consultants.

12. The loan had 13 covenants covering project implementation, financial, environmental, and social issues. Compliance was achieved on all but the financial covenants, which aimed at improving the financial viability of EDC. Procurement was carried out in accordance with ADB procurement guidelines. A consultant was recruited under the project's capacity-building component as a financial management adviser to EDC. The arrangements changed between appraisal and implementation. ADB planned to fund a planning adviser but the World Bank financed this position. ADB instead provided the services of the financial management adviser. EDC appeared to have benefited from this assistance.

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

13. The PCR rated the project as *highly relevant*, both at appraisal and upon completion. This was largely based on the project's consistency with the government's development goals in the sector and with ADB's country strategy. However, diesel oil prices rose to such an extent that private extensions from the neighboring grids became viable. This meant that the generation components of the project in Banteay Meanchey, Kampot, and Takeo were relegated to the secondary role of providing standby generation. In their new role as standby generators, the PCR noted that these installations were somewhat overdesigned.

14. This validation agrees with the PCR's observation that the capital invested in the well-established diesel generation station may have been better invested in extended medium voltage (MV) feeders, whether at 22 kilovolt (kV) or 33 kV, to neighboring grids. The possible implication of the increase in diesel prices should have been considered during the design stage. These detracted from the project's overall relevance. As such, this validation rates the project *relevant*.

B. Effectiveness in Achieving Project Outputs and Outcomes

15. The PCR rated the project *effective*. The project initially planned to install new generation equipment in five towns, and rehabilitate and expand distribution systems in another eight. Cost savings and AFD participation allowed the rehabilitation and expansion of distribution systems in a ninth town. On the output side, 19 diesel generators with capacities of 250 kilowatt (kW) to 1,000 kW were installed with civil and building works and associated facilities. Distribution works that were completed include the following: (i) rehabilitating and/or constructing 228 kilometers (km) of existing 10 kV MV line and upgrading to 22 kV line; (ii) installing 66 overhead and ground-mounted 22 kV switchgear; (iii) installing 188 overhead and/or ground-mounted distribution transformers and substations; (iv) installing 556 km of 400/230 volt (V) low voltage distribution using bundled conductors and reusing existing conductors; (v) installing pole-mounted metering boxes and 46,447 sets of customer meters; (vi) installing 19,508 poles of different sizes; and (vii) installing two sets of main transformers.

16. This validation finds that these outputs contributed to the attainment of most of the envisaged outcomes. It agrees with the PCR that investment in the distribution systems succeeded in reducing losses and significantly increasing the electrification ratio. Power supplies considerably improved in the nine towns, supplies became more widely available, and safety was enhanced because of the increased capacity. Power sales in the project towns were 55,725 MWh in 2007, which was more than double the expected level at the time of appraisal (20,291 MWh). The number of customers grew from 53,232 to 59,261 between 2006 and 2007. Distribution losses were reduced from over 20% before the project to between 8% and 14% in all but one of the project provinces. The PCR indicated that technical training was highly successful, as evidenced by the fact that the generation plants and distribution networks were satisfactorily maintained. Moreover, private contracts were awarded under competitive bidding procedures. Budget for operation and maintenance was allocated, although the amount varied between provinces. However, financial covenants were not fully met. Nonetheless, this validation agrees with the PCR's *effective* rating.

C. Efficiency of Resource Use in Achieving Outputs and Outcomes

17. The PCR rated the project *efficient*. The PCR indicated that the implementation arrangements worked well and resulted in the establishment of permanent project management offices within EDC's organization structure in place of ad hoc project implementation units. However, this validation³ finds the following shortcomings in the PCR's efficiency evaluation:

- (i) **Underutilization of generation assets.** The economic analysis does not appear to have taken into account the fact that some project generation assets have been used for standby generation rather than the envisaged baseload generation, and that the remaining generation sets were to be relegated to standby generation eventually. The generation sets commissioned at Sisophon in June 2006 have been used for standby generation since November 2007 because cheaper grid supplies were available through the ADB-financed grid connection from Thailand. An Independent Evaluation Department mission that visited the Sisophon power plant in March 2009 was informed that although there were occasional outages, it usually took longer to turn up the power of standby generators than it took the grid supply to return. The generators have therefore been idle. The generation sets at Svay Rieng and Kampot have also been used for standby generation since June 2009 because cheaper grid supplies are becoming available via the Vietnamese grid connection. Generation sets in the other two provincial towns (Prey Veng and Stung Treng) are also expected to be on standby once the transmission grid reaches them.⁴ The PCR emphasized the need to have the generators on standby to facilitate the maintenance of the feeders and to ensure supply security because the power supply from Thailand and Viet Nam is not yet reliable and is not within the EDC's control.
- (ii) **Issues with the project completion report's economic and financial analyses.** The PCR's economic and financial analyses appear to have been carried out in less detail during appraisal and as a result, it is difficult to confirm whether figures in the PCR are consistent with those in the report and recommendation of the President (RRP). The following points were noted:
 - (a) Table A11.2 in the RRP showed the summary of electric load forecasts which were not updated in the PCR. In the absence of updated data and information, it is not possible to compare actual demand in 2004 with the projections in the RRP. The actual demand figures are crucial to understanding the benefits that were achieved.
 - (b) The PCR states (Appendix 10, para. 3) that the primary economic benefits from the projects were those benefits the economy receives from having, among other things, an "overall decrease in pollution obtained from increases in the efficiency of its production and distribution." The inclusion of these benefits should have been supported by plausible assumptions but these are not mentioned in the PCR. Also, the PCR does not make clear whether these are resource cost savings. And if these are indeed resource cost savings, the PCR should have clearly documented and shown that there was actual displacement of costly energy operations in the "without-

³ These review findings are based on desk review of all project documents, desk review of the PCR's project spreadsheets, and field work undertaken by IED in Cambodia in March 2009.

⁴ World Bank provided assistance for the power grid connection from Stung Treng to the Lao People's Democratic Republic.

the-project” situation.

- (c) It is not clear how the willingness to pay (WTP) and the subsequent demand curve (and accompanying demand analysis) were estimated. The PCR is also vague on whether an average number was used to represent WTP for all consumer groups. This possibly seems to be the case (para. 6, Appendix 10). Because of the lack of rigor and insufficient documentation presented in the PCR, the accuracy of the WTP could not be verified.
- (d) The PCR indicates (para. 44) that “in the poorer provinces of Banlung, Prey Veng, and Stung Treng, the operations are not viable due to the high diesel oil prices, and a financial internal rate of return (FIRR) could not be determined.” It should be possible to calculate an FIRR even though the figure is negative. The rate of return remains important because it demonstrates the profitability of the operations.
- (e) The PCR states (Appendix 10, para. 1) that “distribution technical losses would roughly increase with the square of the load.” This implies rapidly growing technical losses as supply expands. It is unclear what the actual basis of this calculation was because the figures were not included in the PCR.

- (iii) **Inconsistencies in the project completion report’s economic and financial analyses.** A number of inconsistencies were noted in the PCR and between the PCR and the RRP, especially in relation to the economic and financial rates of return, viz., Para. 44 of the PCR, para 35 of Appendix 10,.

18. Moreover, the project experienced a 2-year delay in implementation mostly related to slippages in recruiting the implementation consultants and subsequent delay in procuring the two major turnkey contracts. These contracts were awarded about 18 months behind schedule. The PCR indicated that this affected the project’s viability. Had the generator stations been built according to the original schedule, at least the communities would have made better use of the investment. Because of these, it is not possible to concur with the PCR’s *efficient* rating. This validation rates the project *less than efficient*.

D. Preliminary Assessment of Sustainability

19. The PCR assessed the project as *likely to be sustainable*. It reported that the Svay Rieng and Kampot distribution systems were connected to the Vietnamese grid, whereas the Banteay Meanchey and Battambang distribution networks were connected to the Thailand grid. Connection of Takeo to the national grid is likely in 2009 as part of the Greater Mekong Subregion (GMS) Transmission Project.⁵

20. The PCR did not compare EDC’s projected financial performance with expectations at the time of the RRP. Nor did the PCR provide any projections of future financial performance to identify what steps were required to sustain profitability and performance. This validation notes that ADB sought input and information from EDC to make these comparisons when the PCR was being prepared but EDC financial staff could not provide the projections of future financial performance in the format used in the RRP.

⁵ ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Kingdom of Cambodia for the GMS Transmission Project*. Manila (Loan 2052–CAM).

21. The financial data in Appendix 11 of the PCR is redacted and it is unclear why this should be since most of this information is copied from EDC's 2006 annual report. Presumably, EDC did not want to show its weak financial performance to the public. The other information in the appendix is detailed financial data on the project towns.

22. Also, the PCR did not address the issues of whether EDC has the human resources to sustain the investments or whether EDC is financially sustainable. It appears that EDC, at the time of project completion, was not financially sound. The PCR reported that the financial covenant on achieving at least cash breakeven for EDC's consolidated operations were not fully complied with. Moreover, the covenant on maintaining a debt service coverage ratio of 1.2 times or more was not met. During appraisal of the subsequent power project (footnote 6), it was realized that the financial target applied for individual EDC branches was unrealistic, since meeting the target would have required unacceptable tariff increases in some provinces. The agreement made under the GMS transmission project loan (footnote 6) repealed all the financial covenants under the project and replaced them with targets for cash breakeven for EDC's consolidated operations and debt to equity ratio. This validation rates the project *less than likely sustainable*.

E. Impact

23. Although the PCR did not rate impact, it identified three areas of impact for the project: environmental, socioeconomic, and resettlement. The environmental impact of the project was small but generally positive in reducing emissions and improving the urban environment. The socioeconomic impact included increases in numbers of residential consumers of 15% and in total electricity consumption of 67%. Resettlement was carried out in accordance with a plan that was agreed with ADB and monitored independently.

24. The PCR reported that total sales of power in the project towns in 2007 were estimated at 55,725 megawatt-hour (MWh), which were higher than the 20,291 MWh envisaged at appraisal. However, it was not clear to what extent the project was able to stimulate economic growth with indirect poverty reduction benefits. Given these, this validation rates project impact *significant*.

III. OTHER PERFORMANCE ASSESSMENTS

A. Performance of the Borrower and Executing Agency

25. The PCR indicated that implementation arrangements were as envisaged at appraisal. Compliance with the loan covenants were achieved except those dealing with financial matters. The EA took an ad hoc approach to these financial covenants. Measures such as debt equity swaps and waiving of import duties helped improve EDC's financial viability, although tariffs were not increased to the levels necessary for EDC to break even despite recommendations from the EDC for tariff increases. The government's counterpart funds were made available in a timely manner, and the independent monitoring agency for resettlement activities confirmed that compensation payments for project affected peoples were completed before the awards of the generating and distribution contracts. However, EDC's absorptive capacity is still limited when it comes to simultaneously implementing several major projects. Overall, the borrower's compliance with covenants was satisfactory, bearing in mind the limited experience of both the government and EDC in borrowing from international agencies. The PCR rated the performance of both borrower and EDC as *satisfactory* and this validation agrees.

B. Performance of the Asian Development Bank

26. ADB conducted 12 review missions during project implementation, including three joint missions with AFD. Responsibility for the loan was passed to the Cambodia Resident Mission during implementation. The borrower and EDC, as executing agency, recognized the positive role of the ADB missions. Overall, ADB's performance was *satisfactory*. This validation concurs.

C. Others

27. The PCR addressed the handling of resettlement problems connected with the project. The resettlement plan was approved by ADB and a loan covenant called for the plan to be implemented prior to the issuance of bid documents. The implementation was independently monitored and the monitoring report confirmed that resettlement was carried out in accordance with the plan.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

28. The PCR rated the project *successful* overall. This validation downgrades it to *less than successful*. The project is rated *relevant*, *effective*, *less than efficient*, and *less than likely to be sustainable* (see table).

Overall Ratings

Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Relevance	Highly relevant	Relevant	The possible implication of the increase in diesel prices should have been considered during the design stage. These detracted from the project's overall relevance (para. 16).
Effectiveness in achieving outcome	Effective	Effective	
Efficiency in achieving outcome and outputs	Efficient	Less than efficient	Implementation delays and issues related to the economic and financial analyses are notable (paras. 19–20).
Preliminary assessment of sustainability	Likely sustainable	Less than likely sustainable	Financial covenants were not met and issue on financial soundness of the executing agency (para. 24).
Overall assessment	Successful	Less than successful	An aggregation of the ratings of the above individual criteria.
Performance of borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Impact	Not rated	Significant	
Quality of PCR		Less than satisfactory	The economic and financial analyses in the PCR contained inconsistencies and were not presented in sufficient detail.

ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report.

Note: From May 2012, IED views the PCR's rating terminology of "partly" or "less" as equivalent to "less than" and uses this terminology for its own rating categories to improve clarity.

Sources: ADB Independent Evaluation Department.

B. Lessons

29. The PCR drew two lessons. The first was that preparing complex turnkey bid documents during the project preparation stage could speed up procurement. This validation concurs with this lesson. The second lesson was that investment in transmission and distribution is less risky than generation and should be the focus of future investment. This lesson is questionable. The problems experienced in generation investment appear to be more related to the type of generators procured than to investment in generation assets per se.

C. Recommendations for Follow-Up

30. A number of recommendations pertain to maintenance and development of the distribution systems with increasing demand. These are all good practice points. On the financial side, the PCR noted the change from project-related financial covenants to covenants related to the overall financial performance of EDC. It proposed regular monitoring, which would be required under continuing loans. It suggested that the size of EDC's lifeline block should be reduced from 50 to 30 units per month. The PCR also recommended support for EDC in evaluating complex turnkey contracts in the future. Finally, it is recommended that a more commercial culture should be developed in provincial branches. These recommendations are reasonable based on the results of the project.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Evaluation Design, Implementation, and Utilization

31. The PCR indicates that there appears to be no system for recording the number and duration of outages on the distribution network. Such a system is needed to assess the extent of outages, determine common causes, and justify such corrective actions. Also, diesel consumption for auxiliary plant in some provinces was excessive. An investigation and/or monitoring system should have been set up.

B. Comments on Project Completion Report Quality

32. The technical discussion in the PCR describes a complex project, including various changes during its implementation. However, there are shortcomings in the PCR, which reduce its value as the final self-assessment of the project. The update of the economic and financial analyses did not cover the full ground. There were also some inconsistencies between the RRP and the PCR, which detracted from the quality of the report. This validation rates the quality of the PCR *less than satisfactory*.

C. Data Sources for Validation

33. The data sources for this validation comprised the RRP, PCR, mission reports, other paperwork collected during the IED rapid sector assessment of the Cambodia power sector, and IED mission's discussions with EDC officials in Sisophon and Takeo.

D. Recommendation for Independent Evaluation Department Follow-Up

34. In view of marked differences in the ratings between the PCR and this validation, a project performance evaluation report may be needed.